4.9 PALEONTOLOGY

The BLM has identified four objectives for the management of fossil resources on lands it administers. They are: 1) locating, evaluating, managing, and protecting fossil resources; 2) facilitating appropriate scientific, educational, and recreational uses of fossils; 3) ensuring that proposed land uses do not inadvertently damage or destroy important fossil resources; and 4) fostering public awareness of the Nation's rich paleontological heritage (BLM 1998:01).

Actions proposed in each of the alternatives for other resources are analyzed here and the possible effects of these actions on paleontological resources are discussed. Because the total number of acres affected by other resource management decisions are not known, qualitative analysis is used to determine which alternative best meets the four goals and objectives identified in the BLM Manual and Handbook H-8270-1 (1998).

In situations where qualitative analyses are used to determine which alternative best meets the four goals and objectives identified by the BLM, a Reasonably Foreseeable Action (RFA) may be used to help predict impacts. The RFAs are potential future actions, such as oil and gas well placement or any other surface disturbing activity, where specific decisions (i.e. actual location of such wells or other activities) cannot be determined during the development of the EIS. These RFAs are not actual allocations or decisions, but a best estimate or a guideline for what actions might be taken in the future. Predictions of potential projects are based on professional judgment regarding approximate project locations, general locality conditions, and design features commonly applied to such projects, and do not definitively determine the outcome of site-specific analysis required prior to implementation of any project.

For the purpose of this resource management plan, all vertebrate and vertebrate trace fossil (tracks, trails, or other indicators of vertebrate activity) localities were identified as to section, township, and range. The total acreage included in sections containing one or more vertebrate or vertebrate trace fossil localities is approximately 147,062 acres.

Outcrops of units such as the Morrison, Mesa Verde, Mancos, Moenkopi, Green River, Uinta, Wasatch, Chinle, Cedar Mountain, and Navajo/Nugget Formations should be considered as Condition 2 areas in the VPA. All of these units contain vertebrate fossils in other locations and may require further assessment where they are exposed in the VPA. Areas where these units are covered or obscured are not Condition 2 areas. The total acreage included in sections in which vertebrate or other scientifically significant fossils would be expected to occur is approximately 1,173,741 acres. Condition 3 areas make up approximately 446,946 acres of the VPA.[1]

Within the VPA, paleontological resources are most often found where there are outcrops of the Morrison, Mesa Verde, Mancos, Moenkopi, Green River, Uinta, Wasatch, Chinle, and Navajo/Nugget Formations. Impacts to paleontological resources result from natural weathering and erosion and from surface disturbance caused by people or animals. Many adverse impacts would be lessened or avoided through the careful application of mitigation measures prior to surface disturbance. Where mitigation is necessary, fossils are collected and taken to secure repositories along with contextual data; therefore, the paleontological record is preserved. The positive effects of mitigation are advances in scientific understanding and regional perspectives that would not be known otherwise. Beneficial impacts often result from efforts at public education and involvement, partnerships, and from the efforts of permitted researchers.

[1] Calculations for condition areas acreages do not include State, Tribal, or Private lands.

4.9.1 Impacts Common to All Alternatives

Management Actions under all alternatives would comply with federal laws, regulations and agency guidelines governing the use and protection of paleontological resources, including but not limited to FLPMA, NEPA, CFR Title 43, Section 8365.1-5, and the BLM Manual H-8270-1 (1998). These authorities mandate and direct the treatment of paleontological resources in the VPA. Locality-specific assessment and mitigation strategies would be implemented where significant paleontological resources would be damaged or destroyed by surface disturbing actions.

Actions relating to fire management, cultural, forage, soils and watersheds, special status species, special designations, visual resource management, wild horses, and wildlife and fisheries would have negligible impacts on paleontological resources and therefore will not be analyzed further.

4.9.1.1 Livestock and Grazing Management

Livestock can have dispersed long-term direct adverse impacts on paleontological resources. Trampling damages and destroys fossils where animals range across outcrops of fossiliferous formations. Livestock could adversely affect paleontological resources in areas of concentration around stock ponds, salt blocks, bedding areas, and along animal trails. Where livestock are eliminated from certain areas, adverse impacts to paleontological resources could occur due to changes in movement patterns.

4.9.1.2 Fire Management and Woodland/Forest Management

Actions related to Fire Management and Woodland/Forest Management could have long-term direct adverse impacts on paleontological resources due to surface-disturbing activities such as creating fire lines and road building.

4.9.1.3 Minerals

Exploration for and development of mineral resources can have short-term and long-term adverse effects on paleontological resources. Surface disturbance that results from mineral exploration (including seismic surveys) and development can affect paleontological resources by damaging or destroying them. Adverse effects include physical damage to or destruction of fossils, as well as increased vandalism and theft that result from improved access to fossil localities. However, following the procedures for assessment and mitigation found in the BLM Manual H-8270-1, Chapter III (1998), would reduce or remove the potential for most of these adverse impacts. Public education and, where necessary, law enforcement actions would reduce unauthorized fossil collecting.

Exploration for and development of mineral resources would also have a beneficial effect on paleontological resources by drawing the attention of a qualified paleontologist to areas that are not currently being researched, resulting in the collection of specimens and data that would not otherwise be recovered.

4.9.1.4 Paleontology

Alternatives developed for paleontology would have both long- and short-term beneficial effects. Each alternative promotes appropriate assessment to facilitate scientific research, encourage partnerships, manage access to significant fossils, reduce unauthorized use of paleontological

resources, and provide for mitigation of adverse effects where necessary to protect them. At the same time, appropriate recreational use of common invertebrate and plant fossils is encouraged, as are public education and interpretation of paleontological resources.

4.9.1.5 Rangeland Improvements

Any action that concentrates livestock in areas where there are significant fossils would cause long-term adverse impacts to paleontological resources. Fences and water sources where animals congregate, if they are placed on or near areas where there are significant fossils, would result in damage or destruction of fossils. Through required assessment of improvement sites, paleontological resources would be identified and improvements would be situated where no resource damage would occur.

4.9.1.6 Recreation

The management goals and objectives for recreation would have both adverse and beneficial long-term impacts on paleontological resources. For example, allowing motorized vehicles up to 300 feet from a designated route increases the likelihood that important or major fossil localities in Condition 1 or Condition 2 areas would be inadvertently damaged or vandalized. The management goals and objectives for recreation also have the potential to benefit paleontological resources. By implementing public education and environmental awareness programs, such as the BLM's Tread Lightly and Leave No Trace programs, added recreational activities in the VPA would reduce illegal fossil collection, vandalism, or accidental destruction. Developed recreation sites are closed to recreational fossil collection (see 43 CFR 8365.1-5(b)). Closing developed recreation sites to surface-disturbing activities would reduce adverse impacts to paleontological resources.

4.9.2 Alternative Impacts

This section summarizes the effects of the management actions (alternatives) proposed in Chapter 2 for paleontological resources. Because the analyses of the management actions presented in this chapter do not reflect specific projects or actions, some effects can only be expressed qualitatively. Quantitative analysis has been included when possible based on specific decisions proposed in Chapter 2, as well as estimates of reasonably foreseeable actions described below. In most cases, subsequent site-specific analyses would be required to implement resource management decisions affecting paleontological resources. More detailed or locality-specific studies and appropriate environmental documents would be prepared in compliance with NEPA and its implementing regulations, as needed.

Effects analyzed in this chapter include direct, indirect, and cumulative effects of the proposed management actions to the extent that they were identifiable for analysis. Where applicable, the short-term or long-term nature of these effects is described. Direct effects result from activities planned or authorized by the BLM and occur at the same time and place. Indirect effects are caused by these actions and occur later in time or farther removed in distance, but are still reasonably foreseeable.

Cumulative effects occur when there are multiple effects on the same resources. They are incremental effects of proposed activities or projects, when combined with past, present, and future actions. As stated in 40 CFR 1508.7 (1997), a "'cumulative impact' is the impact on the environment that results from the incremental impact of the action when added to other past,

present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." The cumulative effects discussed in this chapter address resources for which direct and indirect impacts have been described earlier.

Where surface disturbance occurs within the VPA, the effects on paleontological resources can be beneficial or adverse. Beneficial impacts to paleontological resources would be due to advances in scientific understanding and knowledge of spatial distribution of significant fossil resources. Adverse impacts would be due to disturbances that are uncontrolled or that increase access to areas containing important or valuable fossils. Sub-surface disturbance would also be detrimental to paleontological resources.

4.9.2.1 Impacts of Lands and Reality Decisions on Paleontological Resources

4.9.2.1.1 Alternative A

Under Alternative A, the BLM would pursue the acquisition of Indian Trust Lands near the confluence of South and Sweetwater Canyons and in the Bitter Creek area and would pursue public access at the mouth of Cowboy Canyon, Bonanza Bridge, and Wagon Hound Road. These actions would have potential direct, long- and short-term beneficial effects on paleontological resources as compared to Alternative D – No Action, if significant paleontological resources were thus brought under BLM management. Easements such as that proposed at the mouth of Cowboy Canyon would affect paleontological resources by increasing public access to areas that contain geological units that are very rich in fossil localities. Public access to these areas could result in increased unauthorized use or vandalism, which would have more adverse impacts than Alternative D – No Action.

4.9.2.1.2 Alternative B

Under Alternative B, direct, short-term adverse effects to paleontological resources from BLM lands and realty decisions would be more than Alternative D – No Action, but reduced as compared to Alternative A. Under this alternative, the BLM would pursue only administrative access to Indian trust lands and would not pursue public access to the White River at the mouth of Cowboy Canyon, Bonanza Bridge, and Wagon Hound Road.

Under Alternative B, there would be no direct, long- or short-term impacts to paleontological resources within Indian trust lands in the Bitter Creek area and confluence of South and Sweetwater Canyons or along the White River at the mouth of Cowboy Canyon, Bonanza Bridge, or Wagon Hound Road.

4.9.2.1.3 Alternative C

Lands and realty decisions under Alternative C are similar to Alternative A, except that the BLM would also pursue an easement for the old Uintah Railroad bed from the Utah/Colorado line to Watson in Evacuation Wash. Potential long- and short-term direct impacts paleontological resources from land acquisition decisions under Alternative C would be similar to those described under Alternative A, but would also include the railroad bed easement.

Land withdrawal decisions under Alternative C would be similar to Alternative A, with the exception of the Uintah Railroad easement, which would provide some resource protection. The short-term and long-term indirect impacts of Alternative C would be beneficial by providing greater resource protection than Alternative A and the No Action Alternative.

4.9.2.1.4 Alternative D – No Action

Lands and realty decisions under Alternative D – No Action are unspecified. Any proposal to acquire or dispose of land would be reviewed to determine its potential to effect paleontological resources.

The relative degree of impacts from resource decisions can be compared where Alternative C would have the most adverse impacts to paleontological resources by providing access to more lands. Alternative A would have fewer adverse impacts than Alternative C and Alternative B would have fewer adverse impacts than Alternatives A and C, but more adverse impacts than Alternative D – No Action.

4.9.2.2 Impacts of Mineral Decisions on Paleontological Resources

Minerals decisions under each of the alternatives have the potential to have both beneficial and adverse impacts on paleontological resources within the VPA, as all decisions would involve surface disturbing activities. The difference between the alternatives is in the numbers of acres open to minerals development. For each alternative the number of acres open to surface disturbing activities is less important than the total size of Condition 1 and Condition 2 areas actually disturbed. Under each alternative, proposed actions related to minerals development would be subject to the provisions of NEPA as well as agency guidance (e.g. BLM Handbook H-8270-1). Assessment of possible impacts to paleontological resources and recommendations for any necessary mitigation are required. Because paleontological resources must be assessed and any needed mitigation done by a permitted paleontologist, specimens and data could be collected in areas of mineral development that would otherwise have gone unnoticed.

4.9.2.2.1 Alternative A

Direct effects to paleontological resources resulting from minerals decisions under Alternative A are related to the level of surface disturbance in Condition 1 or Condition 2 areas that occurs under the decisions. The greater the level of permitted surface disturbance, the greater is the potential for encountering paleontological resources in these areas. Under Alternative A, 1,776,782 acres of BLM administered land would be open for oil and gas development within the VPA. Compared to the other alternatives, Alternative A has the second highest number of acres open to surface disturbance related to oil and gas development and the second lowest number of acres closed to surface occupancy or development. As such, Alternative A has a greater potential for impacts to paleontological resources within the VPA than Alternative D – No Action and Alternative C, but a lower potential impact than Alternative B, but only if this disturbance takes place in Condition 1 or Condition 2 areas.

Potential indirect adverse effects on paleontological resources under Alternative A would include vandalism and unauthorized fossil collection that result from increased human activity within areas of mineral development in Condition 1 and Condition 2 areas.

4.9.2.2.2 Alternative B

Long- and short-term direct effects under Alternative B are similar to those described for Alternative A but would be of greater magnitude owing to the higher number of BLM administered acres within the VPA available for oil and gas exploration and development (1,819,397) and the lower number of acres closed to surface occupancy or any form of minerals development.

Indirect adverse impacts to paleontological resources, based upon minerals decisions under Alternative B, are similar to those described for Alternative A but would be of greater magnitude owing to the higher number of acres available for use and the lower number of acres closed to surface occupancy or any form of minerals development.

4.9.2.2.3 Alternative C

Direct effects to paleontological resources resulting from mineral decisions under Alternative C are related to the level of surface disturbance in Condition 1 and Condition 2 areas that is permitted under the decisions. The greater the level of permitted surface disturbance in these areas, the greater the potential for impacting paleontological resources. Under Alternative C, 1,627,085 acres of BLM administered lands would be open to minerals development. Compared to the other action alternatives, Alternative C would have the lowest number of acres open to surface disturbance related to oil and gas development and the highest number of acres closed to surface occupancy or development, but would be greater than Alternative D – No Action. The impacts to the resource, either adverse or beneficial, would depend on the number of Condition 1 and Condition 2 acres that would be developed under this alternative.

The nature of long- and short-term direct effects under Alternative C are similar to those described for Alternative A but would be of lesser magnitude than the other action alternatives (but more than Alternative D) owing to the lower number of acres available for use and the higher number of acres closed to surface occupancy or any form of minerals development and subsequent surface disturbance.

Indirect impacts to paleontological resources, based upon minerals decisions under Alternative C, are similar to those described for Alternative A but would be of lesser magnitude owing to the lower number of acres available for use and the higher number of acres closed to surface occupancy or any form of minerals development.

4.9.2.2.4 Alternative D – No Action

Direct effects to paleontological resources resulting from mineral decisions under Alternative D – No Action are related to the level of surface disturbance in Condition 1 and Condition 2 areas that is permitted under the decisions. The greater the level of actual surface disturbance, the greater is the potential for adversely affecting paleontological resources in these areas. Under Alternative D – No Action, 1,536,030 acres on BLM administered lands within the VPA would be open to oil and gas development. Compared to the other alternatives, Alternative D has the lowest number of acres open to surface disturbance related to oil and gas development and the second highest number of acres closed to surface occupancy or development.

The long- and short-term direct effects under Alternative D – No Action are similar to those described for Alternative A but would be of lesser magnitude than the action alternatives owing

to the lowest number of acres available for oil and gas use and the higher number of acres closed to surface occupancy for oil and gas development (except for Alternative C).

Indirect impacts to paleontological resources based upon minerals decisions under Alternative D – No Action are similar to those described for Alternative A but would be of lesser magnitude owing to the lower number of acres available for use and the higher number of acres closed to surface occupancy for oil and gas development (except for Alternative C).

In relative terms, the highest adverse impacts to paleontological resources would occur under Alternative B, due to the greatest number of acres open to surface disturbance. Alternative A would have the second highest degree of adverse impacts, followed by Alternative C. Alternative D would have the lowest level of adverse impacts to paleontological resources.

4.9.2.3 Impacts of Paleontological Decisions on Paleontological Resources

4.9.2.3.1 Alternatives A, B, C, and D – No Action

Paleontological resource decisions for each of the alternatives would have direct, beneficial impacts on paleontological resources within the VPA. Alternative C would provide the greatest protection for paleontological resources through predictive modeling and broad-scale sampling, also requiring assessment (and where needed, mitigation) in all Condition 1 and Condition 2 areas. Under Alternative A, the use of predictive modeling and broad-scale sampling will streamline the process of assessment and mitigation of adverse effects caused by surface disturbance and would make it more effective. This alternative would provide the second highest degree of protection to paleontological resources. Alternatives B and D – No Action are similar, where impacts would be mitigated as fossils are found. These alternatives would provide the least protection for paleontological resources.

Paleontological Resource Use Permits administered by the BLM Utah State Office for scientific study would provide important information to the VPA about the location and kinds of significant paleontological resources. Providing websites, local interpretive sites, and written information to the public about fossils and hobby collection has the potential to directly increase the public knowledge of the earth sciences and encourage good stewardship, reduce illegal collection, and increase the likelihood that important discoveries would be reported to the BLM.

4.9.2.4 Impacts of Rangelands Improvement Decisions on Paleontological Resources

Paleontological resources would be affected by rangeland improvements if they were placed on areas with fossiliferous units. Generally, the areas would be evaluated for significant fossils if they were in areas likely to contain fossils (Condition 1 and 2). With proper analysis, areas containing significant paleontological resources would be protected from damage by placing fences and other improvements away from fossil localities. In addition, more improvements do not necessarily lead to greater resource disturbance. Improvements that would not be moved, such as reservoirs, in areas with fossiliferous units would be assessed and mitigated, which could lead to new discoveries and increase scientific knowledge. For comparison, the relative number of acres subject to surface disturbance and miles of road, fencing, and pipeline development would be used to quantify impacts.

4.9.2.4.1 Alternative A

Under Alternative A, 34,640 acres of vegetation treatment, 68.5 miles of fencing, 37.5 miles of water pipeline, 51 spring developments, and 812 guzzler or reservoir projects would be completed. Improvements increase the surface disturbance, therefore beneficially increasing the probability of new discoveries. These acreages, miles and numbers of facilities are roughly comparable to those proposed under Alternative D – No Action. It is anticipated that the primary indirect impact would be to increase the adverse potential for concentrated trampling of paleontological localities located in areas adjacent to fencing or reservoirs on barren bedrock. Where cattle, sheep, or other grazers congregate, they could damage or destroy fossils in Condition 1 or Condition 2 areas.

4.9.2.4.2 Alternative B

The overall direct adverse impacts from rangeland improvement decisions on paleontological resources under Alternative B would be greater than those described for Alternative A. Under Alternative B, 50,900 acres of would be subject to vegetation treatment, 368.5 miles of fencing would be installed, 51 miles of water pipeline would be installed, 78 well/spring developments would be undertaken, and 1,165 guzzler or reservoir projects would be completed. These improvements would cover more area than Alternatives A and D – No Action, therefore providing a greater beneficial probability that paleontological resources would be discovered and studied, if improvements are in Condition 1 and 2 localities. Long- and short-term direct impacts to paleontological resources from rangeland improvement decisions would be similar to those described for direct impacts under Alternative A but would be greater under Alternative B if the increased surface disturbance takes place in Condition 1 or Condition 2 areas.

Both short-term and long-term indirect impacts to paleontological resources from rangeland improvement decisions are similar to those described for indirect impacts under Alternative A but would be greater under Alternative B owing to the greater proposed surface disturbance, if the increased surface disturbance takes place in Condition 1 or Condition 2 areas.

4.9.2.4.3 Alternative C

The direct effects of rangeland improvement decisions on paleontological resources under Alternative C would be similar to that described for Alternatives A and B. Rangeland improvement decisions under Alternative C would affect slightly more area, therefore increasing the probability of new discoveries, than those proposed under Alternatives A and D – No Action but less than those proposed under Alternative B. Under Alternative C a total of 45,860 acres would be subject to vegetation treatment, 129 miles of fencing would be installed, 29.5 miles of water pipeline would be installed, 87 well/spring developments would be undertaken and 811 guzzler or reservoir projects would be completed.

Both long- and short-term direct impacts to paleontological resources from rangeland improvement decisions would be similar to those described for direct impacts under Alternative A but would be increased slightly in magnitude under Alternative C owing to the overall greater degree of potential surface disturbance. Long- and short-term direct impacts under Alternative C would, however, be less than those under Alternative B if surface disturbance did not occur in Condition 1 or Condition 2 areas.

Both short-term and long-term indirect impacts to paleontological resources from rangeland improvement decisions would be identical to those described for indirect impacts under Alternative A but would be increased slightly in magnitude under Alternative C owing to the greater potential for surface disturbance. Indirect impacts under Alternative C would, however, be less than those under Alternative B.

4.9.2.4.4 Alternative D – No Action

The overall nature of direct effects of rangeland improvement decisions on paleontological resources under Alternative D – No Action would be similar to that described for the other alternatives. Rangeland improvement decisions under Alternative D would be roughly comparable to those proposed under Alternative A, but are less than those proposed under Alternatives B and C. Under Alternative D a total of 40,390 acres of would be subject to vegetation treatment, 65 miles of fencing would be installed, 35 miles of water pipeline would be installed, 74 well/spring developments would be undertaken and 775 guzzler or reservoir projects would be completed.

Long- and short-term direct impacts to paleontological resources from rangeland improvement decisions would be identical to those described for direct impacts under Alternative A but would be slightly greater under Alternative D, due to higher acreage of vegetation treatment, if Condition 1 and Condition 2 areas are affected. Short-term direct impacts under Alternative D would, however, be less than those under Alternatives B and C.

Both short-term and long-term indirect impacts to paleontological resources from rangeland improvement decisions would be identical to those described for indirect impacts under Alternative A but would be increased slightly in magnitude under Alternative D owing to the overall greater degree of potential surface disturbance. Indirect impacts under Alternative D would, however, be less than those under Alternatives B and C.

In relative terms, the greatest short-term direct, adverse impacts to paleontological resources due to surface disturbance from rangeland improvements and indirect adverse impacts from livestock trampling would be from Alternative B. The next greatest adverse impacts would be from Alternative C, followed by Alternatives A and D – No Action, which would have similar impacts.

4.9.2.5 Impacts of Recreation Decisions on Paleontological Resources

Recreation decisions under each of the alternatives would affect paleontological resources by either increasing visitor use or changing development. Increasing visitor use would affect resources by creating a greater level of surface disturbance, therefore increasing the probability that fossils would be discovered. Conversely, the greater the level of human activity, the greater would be the potential for paleontological resources within a recreational area to be adversely impacted by the number of individuals walking over or visiting paleontological localities. Increased human activity in areas where paleontological resources are present also tends to correspond with increased levels of vandalism, unauthorized collection, and inadvertent damage or destruction of said resources. The beneficial impacts of increased recreational use would be that people might find and report discoveries of important and valuable fossils.

The differing use levels of BLM land designated as SRMAs would affect the paleontological resources in areas known to have these resources. The designation of SRMAs generally increases

recreational activity in given areas, but the only areas known to have important fossil localities at present are Blue Mountain, Red Mountain-Dry Fork, Browns Park, and the White River Corridor. Activity plans created for SRMAs would include provisions to protect unique paleontological resources, therefore impacts would be minimized. Due to lack of paleontological resources in other designated recreation areas, only Blue Mountain, Red Mountain-Dry Fork, Browns Park, and the White River Corridor will be discussed here.

Direct effects on paleontological resources resulting from recreation decisions under all alternatives would be related to the level of surface disturbance associated with recreational development and with the degree of increased human activity in Condition 1 and Condition 2 areas. Potential short- and long-term direct impacts would include increases in levels of unauthorized use and associated vandalism that would accompany increased human activity. It should be noted, however, that regulated recreational use of areas tends to provide better protection to paleontological resources than does unregulated use. Collecting common invertebrate and plant fossils for personal, noncommercial use is an accepted, low-impact use of the public lands, and could foster a greater appreciation for paleontological resources.

Indirect effects of recreation decisions on paleontological resources would include benefits such as increased public enjoyment of hobby collecting, increased interest in the science of paleontology, and generally more public awareness of these resources and how to preserve them. Potential adverse impacts would be the increased unauthorized collection, inadvertent damage, or vandalism in Condition 1 and Condition 2 areas adjacent to developed recreation areas.

Proposed actions governed by federal laws, regulations, and policies, require the preparation of resource management plans that must include prescriptions for the management of paleontological resources. Thus, adverse impacts to paleontological resources would be greater in Condition 1 and Condition 2 areas where recreational activity is not actively managed.

4.9.2.5.1 Alternative A

Under Alternative A, 24,183 acres along the White River Corridor, 52,721 acres in Browns Park, 24,285 acres on Red Mountain-Dry Fork, and 42,758 acres on Blue Mountain would be managed as SRMAs. Additionally, 400 miles of non-motorized trails would be improved and/or developed, and restrictions would be placed on the use of OHVs for retrieval of big game off of designated routes. A total of 800 miles of motorized OHV trails would be developed or improved under this alternative. New cabin construction for permitted/administrative use would be allowed within the VPA but an attempt would be made to consolidate construction in specific areas at or near existing cabins. This alternative would provide fewer adverse impacts to paleontological resources than Alternative D – No Action.

4.9.2.5.2 Alternative B

Direct effects to paleontological resources resulting from recreation decisions under Alternative B are related to the lack of designation and protection of resources associated with recreational development and use. No SRMAs would be designated in the White River Corridor or on Blue Mountain, but Browns Park (18,475 acres) and Red Mountain-Dry Fork (24,285 acres) would continue to be managed as SRMAs. Additionally, under Alternative B 800 miles of motorized trails would be improved or developed, and OHV use off of designated trails would be allowed (with some limitations) for big game retrieval. Under Alternative B, unrestricted and unconfined recreational use of the Book Cliffs would continue as currently managed and new cabin

construction would be allowed within the VPA, but an attempt would be made to consolidate construction in specific areas.

Alternative B is the same as Alternative D – No Action in terms of acres managed as SRMAs. Alternative B generally allows for unrestricted and unconfined use of BLM lands for recreation.

Potential long- and short-term direct effects on paleontological resources under Alternative B are similar to those described for Alternative A with the exception that the increased acreage available for unrestricted and unconfined recreational use under Alternative B would result in the increased potential for damage of paleontological resources. Potential indirect effects under Alternative B are similar to those described for Alternative A.

4.9.2.5.3 Alternative C

Alternative C would designate 47,130 acres in the White River Corridor and 42,758 acres on Blue Mountain as new SRMAs, and maintain 52,721 acres in Browns Park and 24,285 acres on Red Mountain-Dry Fork as existing SRMAs. Additionally, under Alternative C, 400 miles of non-motorized trails would be improved and/or developed, and restrictions would be placed on the use of OHVs for retrieval of big game off of designated routes. No motorized OHV trails would be developed or improved under this alternative. Alternative C would have similar direct adverse effects as Alternative A, with the exception of fewer OHV trails. The lack of OHV trail development would lower the probability of new discoveries of paleontological resources.

Long- and short-term direct and indirect adverse effects on paleontological resources under Alternative C are less than those described for Alternatives A and D – No Action.

4.9.2.5.4 Alternative D – No Action

Under Alternative D – No Action, minimal oversight or lack of designation of new SRMAs would lead to resource degradation due to limited management of these areas. Additionally, 55 miles of non-motorized trails would be improved or developed and the Red Mountain trail would be managed as a motorized OHV trail. No specifications are given for OHV use off of designated trails for the retrieval of big game. In general, Alternative D – No Action would allow for unrestricted and unconfined recreational use of most areas within the VPA and management of new cabin construction is unspecified.

Potential long- and short-term direct and indirect effects on paleontological resources under Alternative D are comparable to those described for Alternative B.

In relative terms, Alternative C has more acres managed as SRMAs and fewer trail-development miles than Alternative A. Alternatives B and D do not designate new areas as SRMAs and generally allow for unrestricted and unconfined use of BLM lands for recreation.

The greatest protection of paleontological resources would be provided by Alternative C, followed by Alternative A. Alternative B would provide greater protection than Alternative D, which would provide the least protection for paleontological resources.

4.9.2.6 Impacts of Travel Decisions on Paleontological Resources

4.9.2.6.1 Alternative A

Direct impacts on paleontological resources within the VPA resulting from travel decisions under Alternative A would be expected to be long-term and beneficial as compared to Alternative D – No Action. Travel decisions under Alternative A provide for the opening, closing, or restricting of areas for OHV travel and for the repair, maintenance, upgrade, or realignment of roads causing resource damage. Alternative A also provides for the closure of roads if repair, maintenance, upgrade, or realignment is not possible or feasible to reduce damage to resources. All of these provisions would have a potential direct beneficial impact on paleontological resources in Condition 1 and Condition 2 areas by reducing and/or controlling surface disturbing travel-related activities. Under Alternative A, 6,202 acres would be open to unrestricted OHV travel. Another 1,643,475 acres would be open to limited or restricted OHV travel, and 75,845 acres would be closed to OHV travel.

Long- and short-term direct impacts on paleontological resources from travel decisions under Alternative A would include increased protection of paleontological resources through the overall reduction of surface disturbing activities associated with general travel and OHV use. Paleontological resources in Condition 1 and Condition 2 areas that are closed to OHV use or where restrictions are placed on OHV use would receive the greatest benefit. Thus, with the specific controls and restrictions placed on travel activities under Alternative A, the long-term net effect would be an overall decrease in the numbers of localities subject to adverse impacts, as compared to Alternative D – No Action.

Both short-term and long-term indirect effects from travel decisions under Alternative A are anticipated to be negligible.

4.9.2.6.2 Alternative B

Under Alternative B, 5,434 acres would be open to unrestricted OHV travel. Another 1,659,901 acres would be open to limited or restricted OHV travel, and 60,187 acres would be closed to OHV travel.

Long- and short-term direct and indirect adverse impacts to paleontological resources from travel decisions under Alternative B are less than those described for Alternative D – No Action, due to lower acreage under Alternative B open to OHV use.

4.9.2.6.3 Alternative C

Alternative C would provide the greatest benefit to paleontological resources in Condition 1 and Condition 2 areas within the VPA by closing greater numbers of acres to OHV use, managing OHV travel, and improving roadways. Under Alternative C, 5,434 acres would be open to unrestricted OHV travel. Another 1,353,529 acres would be open to limited or restricted OHV travel, and 366,559 acres would be closed to OHV travel.

Long- and short-term direct and indirect impacts on paleontological resources from travel decisions under Alternative C are similar to those described for Alternative A but would be of greater magnitude owing to the increased numbers of acres under Alternative C that are closed to OHV use. This alternative provides fewer adverse impacts to paleontological resources than Alternative D – No Action, due to fewer acres open to OHV use.

4.9.2.6.4 Alternative D – No Action

Travel decisions under Alternative D – No Action are largely unspecified. No specific provisions exist for the repair, maintenance, upgrade, or realignment of roadways causing damage to resources. Designations do exist, however, for OHV use within the VPA under Alternative D. These designations provide the least protection to paleontological resources. Under Alternative D, 787,859 acres are open to unrestricted OHV use, largely in Condition 1 and Condition 2 areas. There are 887,275 acres subject to restrictions on OHV use, and 50,388 acres are closed to OHV use.

The large areas that are open to unrestricted OHV use would also be expected to contribute to greater numbers of paleontological localities being subjected to direct primary and secondary impacts resulting from OHV traffic. Higher volumes of unrestricted OHV travel would be expected to have a greater impact on vegetation cover and soil stability, thereby increasing erosional processes that would adversely impact paleontological localities adjacent to OHV use areas.

The highest adverse impacts to paleontological resources would be due to Alternative D – No Action. The second highest degree of adverse impacts would come from Alternative B, followed by Alternative A. Alternative C would provide the least adverse impacts to paleontological resources due to travel decisions.

4.9.2.7 Impacts of Visual Resource Management Decisions on Paleontological Resources

Short- and long-term direct effects on paleontological resources resulting from visual resource management decisions are adverse to paleontological resources if surface disturbance is controlled and limited, and collection of fossils is not allowed in some VRM class areas. If Condition 1 and Condition 2 areas occur where visual resource management includes the reduction, control, or elimination of surface disturbing activities, these limitations would have adverse impacts to paleontological resources. In all cases, these conclusions are based on the assumption that significant paleontological resources would occur in VRM Class I and Class II areas.

4.9.2.7.1 Alternative A

Under Alternative A, 67,357 acres within the VPA would be managed as VRM Class I, the highest level of VRM value and the one with the most limitations on surface disturbing activities. Another 446,287 acres would be managed as VRM Class II, 1,091,814 acres would be managed as VRM Class III, and 868,542 acres would be managed as VRM Class IV, the least restrictive visual resource management class. Compared to the other alternatives, Alternative A would provide the second highest level of overall direct adverse impacts to paleontological resources (behind Alternative C) as a total of 513,644 acres would be managed as the two highest VRM classifications. Visual resource management decisions under Alternative A would provide a less benefit to paleontological resources than do those under Alternatives B and D – No Action. Long- and short-term indirect impacts on paleontological resources from visual resource management decisions under Alternative A include adverse impacts due to the overall reduction of surface disturbing activities within the areas managed as the two highest VRM classes, VRM I and VRM II However, the specific controls and restrictions placed on surface disturbing activities in areas managed as the two highest VRM classes would result in an overall decrease in

the numbers of localities subject to surface disturbance, as compared to Alternative D – No Action.

4.9.2.7.2 Alternative B

The overall indirect effect of visual resource management decisions on paleontological resources under Alternative B would be roughly comparable to but slightly greater than that described for Alternative D. Under Alternative B, 56,127 acres would be managed as VRM Class I, and 230,674 acres would be managed as VRM Class II. Another 300,376 acres would be managed as VRM Class III, and 1,886,822 acres would be managed as VRM Class IV. This Alternative would provide roughly the same acres designated under VRM Class I and II as Alternative D – No Action, with impacts on paleontological resources similar to those for the No Action Alternative.

4.9.2.7.3 Alternative C

The direct and indirect, long- and short-term adverse effects of visual resource management decisions on paleontological resources under Alternative C would be greater than that described for any other alternative. Under Alternative C, 148,260 acres would be managed as VRM Class I, and 620,630 acres would be managed as VRM Class II. Another 861,281 acres would be managed as VRM Class III, and 843,829 acres would be managed as VRM Class IV. Due to the highest number of acres designated under these restrictive classes, Alternative C would have the most adverse impacts on paleontological resources when compared to Alternative D – No Action.

4.9.2.7.4 Alternative D – No Action

Under Alternative D – No Action, short-term or long-term direct effects resulting from visual resource management decisions would be adverse to paleontological resources if surface disturbance was controlled and limited, and collection of fossils was not allowed in some VRM class areas. Indirect adverse effects of visual resource management decisions on paleontological resources under Alternative D would be substantially less than that described for any other alternative. The lower number of acres managed as either VRM Class I or VRM Class II under Alternative D would have fewer adverse effects on paleontological resources in Condition 1 and Condition 2 areas within the VPA. Under Alternative D, 56,127 acres would be managed as VRM Class I, and 230,330 acres would be managed as VRM Class II. Another 300,656 acres would be managed as VRM Class III, and 1,886,887 acres would be managed as VRM Class IV.

In relative terms, the highest degree of adverse impacts to paleontological resources would occur under Alternative C. Alternative A would have the second highest degree of adverse impacts, followed by Alternative B. The fewest adverse impacts would occur under Alternative D.

4.9.3 Unavoidable Adverse Impacts

Loss due to non-recognition, lack of information and documentation, erosion, casual collection, and inadvertent destruction or use would cause resource losses. The rate, extent, intensity, and duration cannot be quantified at this time due to lack of data. As a part of natural environmental processes, paleontological localities will be exposed, remain for a time, and become lost to history if not recorded or studied. The focused actions due to the Proposed Action and Alternatives would cause losses over and above the natural attrition rate but cannot be quantified

at this time. However, the broad-scale sampling and classification of areas with high likelihood of containing paleontological resources is expected to greatly reduce the probability of unavoidable adverse impacts to the resource.

4.9.4 Short-term Uses Versus Long-term Productivity

The short-term uses of BLM lands for activities involving surface-disturbance would have long-term impacts on paleontological resources. The surface-disturbing activities affecting paleontological resources would include mineral development, livestock trampling, and building of fire lines and roads in wildland fire management. Travel decisions involving maintenance, upgrade, and realignment of roads and OHV use would also have long-term adverse impacts on these resources. Providing access for the public through Lands and Realty decisions and OHV use would also increase the potential for vandalism and the inadvertent destruction of paleontological resources.

4.9.5 Irreversible and Irretrievable Impacts

Irreversible and irretrievable impacts to paleontological resources would occur where unavoidable adverse impacts destroy fossil resources.

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